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Summary

APPLICATION OF RECEPTOR MODELING TO TRACE THE SOURCES OF $PM_{2.5}$, Hg^0 AND PAHs IN NEW YORK STATE

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Over a period of two summers, $PM_{2.5}$ mass, its composition, total PAHs, and vapor phase mercury concentrations were determined at Potsdam and Stockton, NY. Stockton is in southwestern NY (Chautauqua County) while Potsdam is in the St. Lawrence River Valley. These sites represent an excellent opportunity to sample air as it is advected into New York State from the southwest and then again after it has tranversed an area containing several coal-fired power plants. In general, the concentrations of PM mass composition except soil elements (Si, Al, Mg, Ca, and Fe) were higher at the Stockton site than at the Potsdam site in 2000. Sulfate, nitrate, ammonium and black carbon were the major contributors to the $PM_{2.5}$ mass at both sites. Total PAH concentrations were slightly higher at the Potsdam site than at the Stockton site, however the opposite was true for Alk-PAHs in 2000. The average concentration of vapor phase mercury at Potsdam was higher than that at Stockton in 2000 while in 2001, the concentration was generally higher at Stockton. The temporal variation of vapor phase mercury concentration shows that the vapor phase mercury concentration varied with ambient temperature in 2000. Back trajectories were calculated using NOAA HY-SPLIT 4 for everyday when samples were collected. The wind directions at Potsdam show a notable dissimilarity between the two summers. This difference in meteorological regimes may cause the observed differences in the relative pattern of concentrations for all compounds considered in this study between two years.

PMF (Positive Matrix Factorization) was used to determine the source profile and source contribution for both of the receptor sites. Six factors were resolved from both sites. Among the six sources, four are common. They are secondary sulfate with a high concentration of S; nitrate source which is dominated by NO_3^-; soil represented by Al, Si, Ca, Fe; motor vehicle with high concentration of Black carbon; biomass burning characterized by K. At the Potsdam site, Cu smelter with high concentration of Cu was resolved. At the Stockton site, a factor mixed with Cu, Zn, Hg was resolved.

PSCF (Potential Source Contribution Function) was used to identify the potential source regions and preferred transport pathways for some of the chemical species. Preliminary results show areas in the Central United States, around Detroit, Illinois, Ohio, and Western Pennsylvania and south New York State are more likely contribute $PM_{2.5}$ to both sites. For the Black Carbon component, high potential sources indicated for both sampling sites are shown to be in areas around Lakes Erie and Ontario, and areas north of Toronto. Also, areas in the Central United States, around Detroit, Illinois, Ohio, and Western Pennsylvania are more probable to be high potential sources of BC. Areas around Northern New York, up through Montreal are another possible source, with a relative high PSCF value. Lake Michigan, and Northern Michigan are shown to be a possible potential source of BC as well.

This study showed that PMF combined with PSCF was a useful approach to identify sources and find their possible locations from the ambient aerosol concentration data.

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